BTEC Assignment Brief

Qualification	Pearson BTEC International Level 3 Subsidiary Diploma in Engineering Pearson BTEC International Level 3 Foundation Diploma in Engineering Pearson BTEC International Level 3 Diploma in Engineering Pearson BTEC International Level 3 Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Diploma in Mechanical Engineering Pearson BTEC International Level 3 Diploma in Computer Engineering Pearson BTEC International Level 3 Diploma in Manufacturing Engineering Pearson BTEC International Level 3 Diploma in Aeronautical Engineering Pearson BTEC International Level 3 Extended Diploma in Engineering Pearson BTEC International Level 3 Extended Diploma in Electrical/Electronic Engineering Pearson BTEC International Level 3 Extended Diploma in Mechanical Engineering Pearson BTEC International Level 3 Extended Diploma in Computer Engineering Pearson BTEC International Level 3 Extended Diploma in Manufacturing Engineering Pearson BTEC International Level 3 Extended Diploma in Aeronautical Engineering
Unit number and title	**Unit 25: Mechanical Behaviour of Metallic Materials**
Learning aim(s)	**B:** Explore safely the mechanical properties of metallic materials and the impact on their in-service requirements
Assignment title	Destructive and non-destructive testing of metal samples
Assessor	
Issue date	
Hand in deadline	

Vocational Scenario or Context	You are working as an apprentice technician for a large company that manufactures hydraulic systems and airframe components for the aerospace industry. It is now time for you to spend a few weeks in the quality assurance department where you will assist with quality checks on incoming raw materials. The quality manager asks you to assist a technician in preparing and mechanically testing samples taken from bar stock. You will also help with the inspection of cast and forged components to determine if they are free from surface and internal defects.

Task 1	You are going to carry out a range of destructive and non-destructive tests on metal samples. Use a log book to record all data, information and images. **Destructive testing** **To do this:** Your tutor will provide you with a selection of unlabelled ferrous and non-ferrous samples which are ready to mount into the test equipment. You will be determining the mechanical properties of the test pieces. **You need to:** • Safely set-up and carry out tensile tests by pulling to destruction, recording load/elongation and the condition of the fracture surface. Properties to be determined - limit of proportionality/elastic limit, yield point, tensile strength, Young's Modulus of Elasticity, percentage elongation and percentage reduction in cross-sectional area • Safely set-up and carry out spot hardness tests, recording results against what is expected • Safely set-up and carry out impact tests, recording results - include energy transfer at impact and condition of fracture surface (to establish if brittle or ductile fracture). **Non-destructive testing** **To do this:** Your tutor will provide you with one processed and one non-processed material sample that have surface flaws (e.g. cracks) **or** internal faults (e.g. inclusions). **You need to either:** • Use a visual technique such as dye penetrant to identify surface flaws in the two material samples, recording findings as annotated images **Or** • Use a technique such as ultrasound to identify internal flaws in the two samples, recording findings, images and notes. **You then need to:** Produce an organised technical report that includes data and information from the above tests that has two sections: **Destructive testing** • A comparison of the mechanical properties found by experimentation with those in an accredited data source. • A determination of what materials were tested and whether they have been processed. • A discussion about how the mechanical properties of metals affect their behaviour and suitability for different applications supported by case study examples, for example, the use of mild steel for products that involve press work in their manufacture. • A discussion about the testing methods used, given the mechanical properties being measured, making reference to features such as reliability and accuracy of results taken.

	Non-destructive testing • Images and written commentary that identify the defects in the components/materials tested. • Discussion about what has caused the defects and how they could be avoided in the future.
Checklist of evidence required	A portfolio containing a log book and report including written commentary, tabulated numerical data, force/extension and stress/strain graphs, images, learner observation records etc.
Criteria covered by this task:	
Unit/Criteria reference	To achieve the criteria you must show that you are able to:
25/B.D2	Evaluate, using the results from safely conducted tests and an accredited data source, how the mechanical properties of processed and non-processed metallic materials affect their behaviour and suitability for different realistic applications, justifying the validity of the test methods used.
25/B.M2	Conduct destructive and non-destructive tests accurately on different non-processed and processed metallic samples.
25/B.M3	Analyse, using the test results and an accredited data source, how the mechanical properties of metallic materials affect their behaviour and suggest a realistic application.
25/B.P3	Conduct destructive tests safely on different non-processed and processed metallic samples.
25/B.P4	Conduct non-destructive tests safely on at least two non-processed and processed metallic samples.
25/B.P5	Explain, using the test results, how the mechanical properties of metallic materials affect their behaviour and suggest an application.
Sources of information to support you with this Assignment	Books Materials for Engineers and Technicians 6th Edition; Bolton W, Higgins R A; Routledge, 2014; ISBN 978-1138778757 Websites matweb.com makeitfrom.com
Other assessment materials attached to this Assignment Brief	Mechanical properties data base Prepared test specimens Components for non-destructive testing **Note to assessor** [please delete this section on issue to learners] It is perfectly acceptable for each learner to test just three samples and to pool the raw data gathered between two learners (in pairs). They will then go on to evaluate this data on an individual basis. If this approach is used, only the accuracy of the learner's own test results will be assessed for B.M2.